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ALLUVIAL VALLEY FLOOR DECISION DOCUMENT

For a Portion of Cow Creek Adjacent to
Western Energy's Proposed Area D Mine

Prepared by

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I. INTRODUCTION

This document presents the Department of State Lands (DSL) determination on the alluvial valley floor status of the headwater portion of Cow Creek adjacent to Western Energy Company's proposed Area D Mine. An initial decision document (DSL, 1984) reported that Pony Creek from its headwaters to the eastern boundary of Section 21, T2N, R42E and Spring Creek from its headwaters to the eastern boundary of Section 9, T2N, R42E were not alluvial valley floors. The document also reported that the portion of Cow Creek from its headwaters to the area just upstream of the upper hayfield in Section 31, T2N, R42E was not an alluvial valley floor while the area from the western edge of this field to the eastern boundary of Section 4, T1N, R42E was an alluvial valley floor.

Subsequent to the initial decision document, Western Energy Company submitted additional geologic, hydrologic and agricultural information on the lower portion of Cow Creek. In light of the recently submitted information and of previous discussions with Western Energy Company's hydrologic staff, the Department has determined that although the lower portion of Cow Creek meets the geologic criterion, it fails to meet the agricultural criteria and therefore is not an alluvial valley floor. Therefore, the entire reach of Cow Creek from its headwaters to the western boundary of Section 4, T1N, R42E is not an alluvial valley floor.

As the alluvial valley floor status for the portions of Pony Creek, Spring Creek, and Cow Creek from its headwaters to Section 31, T2N, R42E have not changed from the original decision document, the criteria on which those determinations were made will not be reiterated in this document. The decision on the non-alluvial valley floor status for the portion of Cow Creek from Section 34, T2N, R42E to the western boundary of Section 4, T1N, R42E is discussed below.

II. COW CREEK

As described in Montana's Strip and Underground Mine Reclamation Rules and Regulations 26.4.325(2)(b)(ii), the Department shall determine that an alluvial valley floor exists if it finds that:

Unconsolidated streamlaid deposits holding streams are present; and

There is sufficient water to support agricultural activities as evidenced by:

> The existence of flood irrigation in the area in question or its historical use;
>
> The capability of an area to be flood irrigated, based on stream-flow water yields, soils, water quality, and topography; or
>
> Subirrigation of the lands in questions derived from the groundwater system of the valley floor.

Each criterion will be discussed separately. An additional section discusses the impacts of Montana Power Company's ash disposal pond construction activities on Cow Creek's alluvial system.

1. Presence of Unconsolidated Streamlaid Deposits

Mapping of alluvial terraces and the extent of alluvium along Cow Creek has been reevaluated based on additional observation well log data obtained since preparation of the two previous Cow Creek reports (Hydrometrics 1982, 1983). The additional data have resulted in few changes from what was originally presented in the previous reports.

Cow Creek alluvium generally consists of about 10 feet of sand and silt overlying up to 25 feet of gravel. The gravels are underlain by sandstones or siltstone of the Fort Union Formation. Alluvium in tributary channels contains up to 18 feet of clay, silt, sand, and gravel.

The geomorphic characteristics of this portion of Cow Creek consist of lower and middle alluvial terraces. Cow Creek typically begins in headwater tributaries as grassed drainages underlain by bedrock or very thin alluvium. Terrace levels are not well-defined in the headwaters, but an active lower and an occasional middle terrace can be distinguished further downstream as the drainage area increases and tributaries coalesce.

2. Sufficient Water to Support Agricultural Activities

a. The existence of flood irrigation

The initial decision document reported that approximately 45 acres of alfalfa hayland were intermittently flood irrigated. This acreage figure was provided in earlier alluvial valley floor reports prepared by Hydrometrics (1982, 1983). When the reports were prepared, access to the alfalfa field was restricted. The acreage figure was based on an assumption that the entire width of the field behind the three spreader dikes, as determined from aerial photos, could be flood irrigated. Although there was no evidence that the dikes ever extended the full width of the field, the assumption was used and the 45-acre figure was included in the reports.

A recent field survey of the area behind the three dikes indicated that approximately three acres could be flood irrigated as the dikes currently exist (Hydrometrics, 1984). The recent history of flood irrigation by the spreader dike system indicates that in the last four years up to three acres have been flooded once and less than one acre was flooded a second time.

Therefore, up to three acres of an 83-acre alfalfa field are being intermittently flood irrigated. One criterion of an alluvial valley floor is that sufficient water is available to support agricultural activities. Agricultural activities, with respect to alluvial valley floors, is defined as the use of any tract of land for the production of plant or domestic animal life where the use is enhances or facilitated by subirrigation or flood irrigation associated with alluvial valley floors (ARM 26.4.310(6)). Due to the limited acreage and infrequent nature of flood irrigation, the Department does not believe that the spreader dike system is enhancing alfalfa productivity for that field.

The three spreader dikes were constructed in 1958 apparently as an experimental practice. According to the current land manager, Bailey Egan, two of the three dikes breached several years ago and repairs to the dikes were not worth the effort. Evaluation of aerial photographs indicated that as early as 1973 two of the three dikes were breached. Montana Power Company did not purchase the land along Cow Creek until 1981 at which time it was leased back to Bailey Egan. Prior to breaching the dikes had the potential, based on topography, to irrigate between 10 to 20 acres.

The hayfields along this portion of Cow Creek are an important part of the overall ranching operation. When the fields do not produce an adequate hay supply to overwinter livestock, hay must be bought or hauled from another ranching operation. No more than one cutting has been taken off the fields. Considering the importance of the fields to the ranching operation, it would seem logical that if the spreader dike system enhanced the productivity of the field, repairs to the dikes would have been made.

In conclusion, although a flood irrigation system is present, the Department determined that alfalfa production is not being enhanced by the system. Therefore, this portion of Cow Creek does not meet the flood irrigation criterion of an alluvial valley floor.

b. Capability to be flood irrigated

In evaluating the capability to flood irrigate, the Department considered surface water quality and quantity, type of soils, information provided by the landowner and regional irrigation practices. Water quality and soil type appear to be suitable for flood irrigation purposes (Hydrometrics, 1982). However, the volume of surface flow does not appear to be adequate for flood irrigation. Instantaneous streamflow measurements along upper Cow Creek showed only occasional flows, which were less than 5 gpm in 1981 and 1982. A flume and continuous recorder were installed just upstream of the alfalfa field in April 1982. Since installation, a single flow event at a peak discharge of 17 cfs has been recorded at this flume in August 1984.

As stated above, the land manager reported that the dikes breached several years ago and repairs were not worth the effort. The Office of Surface Mining AVF Identification and Study Guidelines (1983) suggest the importance of evaluating abandoned irrigation structures in assessing capability. The lack of maintenance, however, does not preclude the presence of an alluvial valley floor. Each situation must be evaluated separately to determine if the cause of abandonment was related to lack of water or poor quality of water or soil. In the case of Cow Creek, the lack of maintenance on the spreader dikes may have been related to an insufficient and undependable surface flow.

In regard to regional irrigation practices, irrigation systems in the Colstrip area was installed primarily to quali~~t~~fy land for homesteading under the Desert Lands Act. The lack of maintenance or new construction of flood irrigation systems in ephemeral drainages similar to Cow Creek suggest that the capability to develop a viable irrigation system is limited.

In conclusion, the capability to flood irrigate along this portion of Cow Creek appears to be limited by quantity and dependability of surface flow. Evaluation of regional irrigation practices indicates that maintenance or construction of irrigation systems in drainages similar to Cow Creek is not occurring.

c. Subirrigation

A report prepared by hydrometrics (1982) originally identified approximately 26 acres of potentially subirrigated hayland. According to the report, the extent of subirrigation was based on evaluation of existing plant communities, color infrared (CIR) aerial photography and water level data from alluvial wells.

The term moisture enhanced vegetation would have more appropriately described the acreage originally identified as subirrigated. It is difficult to separate actual subirrigation caused by shallow water tables from moisture enhancement due to topography, soils or other localized factors, particularly when using plant community description and CIR photographs. In subsequent Hydrometrics reports (1983, 1984), the term "moisture-enhanced vegetation" was used to describe the acreage originally identified as subirrigated.

In assessing the presence of subirrigation, the Department considered the depth to groundwater. Water level data from alluvial wells located on the lower terrace immediately upstream and downstream of the alfalfa field suggest the depth to groundwater may be too deep to enhance alfalfa productivity. The average depth to groundwater during the growing season for the adjacent wells was between 17 and 18 feet. Assuming an effective capillary fringe of 3 feet (DSL, 1982), the depth to groundwater plus capillary fringe would be at or below the 14-foot level. Dollhopf (1982) noted that when groundwater level plus effective capillary rise is deeper than 14 feet, an alfalfa crop will not be subirrigated and yields will be comparable to those under dryland conditions.

Another method used to determine the presence of subirrigation was the evaluation of groundwater levels before and after the first killing frost. The halt of evapotranspiration caused by the first killing frost in the fall may cause groundwater levels to rise if vegetation is subirrigated. Groundwater level data for the alluvial wells immediately upstream and downstream of the alfalfa field do not show an increase of water levels in the fall compared to spring and summer readings (Hydrometrics, 1984; Western Energy HRDVII). Therefore, it appears that plant use of groundwater at least to the extent of influencing the groundwater level is not occurring.

Color infrared (CIR) aerial photographs were reviewed for evaluating areas of potential subirrigation. The Department reviewed a sequential series of CIR photographs taken June and October, 1977; June and September, 1978, July and September, 1983. Evaluation of the photographs indicated the lack of subirrigation. The fields did not show signs of pink or red hues as would be expected in subirrigated conditions.

Montana Power Company's construction activities associated with the ash disposal pond have disturbed some of the area previously identified as subirrigated/moisture-enhanced vegetation (Hydrometrics, 1984). Almost the entire upper alfalfa field and a smaller portion of the lower field have been removed. A separate section discussing the impacts of construction activities on Cow Creek's alluvial system is provided below.

In conclusion, the Department does not believe that subirrigation is occurring along the lower terrace, at least to the extent of enhancing alfalfa productivity. Therefore, this portion would not meet the subirrigation criterion of an alluvial valley floor.

3. Effect of MPC Borrow Pits on the Cow Creek Alluvial System

In the southern portion of Section 32, T2N, R42E, two alfalfa fields existed in the Cow Creek Valley bottom prior to construction of the Montana Power Company's fly ash disposal pond. Most of the alluvial material of the upper field was removed for use as fill for the dam. About 10 feet of silty clay material was stripped off, leaving about 2 feet of fine-grained sediment overlying coarser-grained alluvium. A temporary berm was constructed across the lower end of the disturbed area to control erosion. The berm will be removed when an adequate vegetative cover has been established on the stripped area.

Another borrow area was excavated on a bench south of the dikes in the lower field. Precipitation and runoff collected in the bottom of this pit discharge along a ditch onto the Cow Creek bottom downstream of the lowermost dike.

Impacts to the alluvial system of Cow Creek from the construction activities will be minor and generally short-lived. Potential and actual impacts fall into the following categories: surface flow, infiltration, subsurface flow and evapotranspiration.

Surface flow off the upper disturbance area will be temporarily affected due to the construction of the berm across the lower end of the disturbance. This berm impounds surface water that would normally flow unimpeded. These waters would either evaporate or seep into the alluvium. Thus, while the berm is in place, the amount of surface water potentially available to the lower field would be reduced. However, the quantity impounded would likely be small and the effect of reduced surface flow negligible.

The borrow pit adjacent to the dikes in the lower field should also have little effect on the alluvial system. Very little runoff appears to come from the hills south of the pit as evidenced by the lack of erosional features on the hillsides and the highly permeable nature of the clinker and sandstone comprising the hills. Because the borrow pit comprises only a small portion for the Cow Creek drainage above the fields, the loss of runoff from the area is insignificant.

The infiltration rate should not be affected by the disturbance of the upper alfalfa field. Because the material remaining at the surface of the stripped area is similar in texture to the original surface, the rate of infiltration would be unchanged. The evapotranspiration rate would probably increase due to the shorter distance from the surface to the water table and corresponding greater utilization of groundwater by vegetation. This would affect a small decrease in the quantity of alluvial water downstream of the disturbed area once a stable vegetative cover is established.

The construction activities should have little effect on surface or groundwater quality. Waters impounded behind the temporary berm may undergo a slight increase in dissolved solids due to evaporation. This effect would probably not be significant because surface flows are generally of high quality and the increase in TDS would be small.

III. SUMMARY

This document and the previous decision document present the Department's determination on the alluvial valley floor status for the headwaters portions of Cow, Pony, and Spring creeks. As stated in the initial decision document, Pony Creek, Spring Creek, and the portion of Cow Creek from its headwaters to the upper hayfield in Section 31, T2N, R42E, although meeting the geologic criterion, failed to meet the agricultural criteria and therefore are not alluvial valley floors. Also a lower portion of Cow Creek from the upper hayfield to the eastern boundary of Section 4, T1N, R42E was initially considered to be an alluvial valley floor.

Subsequent to the initial decision document, additional information was submitted on the lower portion of Cow Creek. As a result of this information, the Department has determined that although the lower portion of Cow Creek meets the geologic criterion, it fails to meet the agricultural criteria due to the lack of enhancement of alfalfa production from flood irrigation and/or subirrigation. Therefore, the entire reach of Cow Creek from its headwaters to the western boundary of Section 4, T1N, R42E is not an alluvial valley floor.

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